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KENYON & KENYON
1500 K STREET, N.W., SUITE 700
WASHINGTON, DC 20005

EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 02/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/899,852	RIESS ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 July 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/9/01 to 12/13/01*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-19 of the application have been examined.

Foreign Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on application 9926167.9 filed on November 4, 9199 and 16938.3 filed on July 10, 2000 in UK and PCT applications 00/02648 and 00/02634 filed on July 10, 2000. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

3. Acknowledgment is made of the information disclosure statements filed on July 9, 2001, September 12, 2001, October 10, 2001, December 27, 2001 and December 13, 2002 together with copies of various papers. The patents and papers have been considered.

Drawings

4. The drawings submitted on July 9, 2001 are accepted.

Specification

5. The disclosure is objected to because of the following informalities:

Page 2, Para 4, Line 10, "$a_{-k1},\ldots a_{k2}$" appears to be incorrect and it appears that it should be "$x_{n-k1},\ldots x_{n+k2}$".

Page 8, Para 34, Line 2, "K_1 postcursors and K_2 precursors" appears to be incorrect and it appears that it should be "K_1 precursors and K_2 postcursors".

Page 17, Para 72, Lines 11-12, "The estimation method described above can be generalized the situation in which the constellation may be non symmetrical and the separation

between points may be non-uniform" appears to be incorrect and it appears that it should be "The estimation method described above can be generalized to the situation in which the constellation may be non symmetrical and the separation between points may be non-uniform".

Appropriate corrections are required.

Claim Objections

6. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

7. Claim 3 is objected to because of the following informalities:

Claim 3, Line 6, "q_J is an index provided along along the J^{th} axis of the constellation" appears to be incorrect and it appears that it should be "q_J is an index provided along the J^{th} axis of the constellation".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claims 1, 2, 5-8, 11-14 and 17 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

9.1 Claim 1 states in part, "estimating a constellation size from a set of maximally-sized reliable symbols". The specification does not describe anywhere how the constellation size is estimated from a set of maximally-sized reliable symbols.

9.2 Claim 2 states in part, "$P_1{}^{\wedge q} = \text{sign}(q)\ (P_1{}^{\wedge max} / (\sqrt{M} - 1))\ (2|q| - 1)$, where $P^{\wedge max}$ represents the estimated constellation size". The estimation of the constellation size is not described in the specification anywhere. In addition, the equation appears to be incorrect. The Examiner substituted for $P_1{}^{\wedge max}$, a value of 64 and for M a value of 6 and for q values ranging form –3 to 3, but could not get the constellation points (-3,-3; -3,3; -1,1; etc.). A constellation point in QAM-64 has two values for the x and y coordinates corresponding to I and Q components. How can one value, $P_1{}^{\wedge q}$ specify a constellation point?

9.3 Claim 5 states in part, "$e_1{}^{\wedge} = (1/s)\ \Sigma_q\ (1/\ (2|q| - 1)\ \Sigma_{n\in sq}\ (P_1{}^{\wedge q} - y_n{}^q)$

$$P_1{}^{\wedge q} = \text{sign}(q)\ (P_1{}^{\wedge max} / (\sqrt{M} - 1))\ (2|q| - 1)$$

$P^{\wedge max}$ represents the estimated value of the magnitude of the maximum constellation point, …

$\{ y_n{}^q \}$ are the set of sample values which are reliable symbols that are associated with the q^{th} estimated constellation point". The estimation of the magnitude of the maximum constellation point or the constellation size is not described in the specification anywhere. The computation of $e_1{}^{\wedge}$ also appears to be incorrect. The variable $P_1{}^{\wedge q}$ gives the coordinate values for the constellation point, while $y_n{}^q$ gives sample values which are reliable symbols, meaning the signal strength or power of the reliable symbols. How can one perform arithmetic operations with a coordinate point which is dimensionless with a signal strength or power?

9.4 Claim 6 states in part, "calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate

sample". The constellation point is defined by its I and Q coordinate values of the point in the constellation and the coordinate values are dimensionless. In order to calculate the reliability factor of a candidate sample, one needs the signal strength or power. How can one calculate the reliability factor of a candidate sample from constellation points?

9.5 Claim 7 states in part, "$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} (|P_{n-i}| c_i,$ where P_{n-i} is the value of a constellation point nearest to the sample y_{n-i}". The constellation point is defined by its I and Q coordinate values of the point in the constellation and the coordinate values are dimensionless. In order to calculate the reliability factor of a candidate sample, one needs the signal strength or power. How can one calculate the reliability factor of a candidate sample from the value of the constellation points? The specification does not describe anywhere what is meant by "the value of a constellation point " and how it is calculated or measured. Is it known to one of ordinary skill in the art? If so, the applicants are directed to provide evidence in the form of prior art material to substantiate such assertion.

9.6 Claim 8 states in part, "the reliability of a two-dimensional candidate sample y_n is given by:

$$R_n = \Sigma_{i=-K1, i\neq 0}^{K2} \sqrt{(P_{1n-i}^2 + P_{2n-i}^2)} \,.\, c_i, \text{ where}$$

P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i}". The constellation point coordinate values are dimensionless. In order to calculate the reliability factor of a candidate sample, one needs the signal strength or power. How can one calculate the reliability factor of a candidate sample from the dimensional values of

the constellation points? The above equation appears to be incorrect. The specification does not describe anywhere how the above equation was arrived at and what was the rationale for the same.

9.7 Claim 11 states in part, "for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples". The specification does not describe anywhere what is meant by "the values of a constellation points " and how it is calculated or measured.

9.8 Claim 12 states in part, "for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol". The constellation point is defined by the coordinates of its I and Q components. The specification does not describe anywhere what is meant by "the value of a constellation point " and how it is calculated or measured. Therefore "comparing a value of a constellation point nearest to the sample to a second threshold" is not defined and is not described anywhere in the specification.

9.9 Claim 13 states in part, "adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}". The specification does not describe anywhere what is meant by "a value derived from a constellation point" and how it is calculated or measured.

9.10 Claim 14 states in part, "the adding adds a scaled value of the constellation point to the reliability factor". The specification does not describe anywhere what is meant by "a scaled value of the constellation point" and how a value of the constellation point is calculated or measured.

9.11 Claim 17 states in part, "determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold,

if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol". The constellation point is defined by the coordinates of its I and Q components.. Therefore "determining whether any of a plurality of constellation points ... is within a predetermined threshold", and "if none of the constellation points exceed the threshold" are not defined and these are not described anywhere in the specification.

10. Claims 2 and 5 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the claim in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

10.1 Claim 2 states in part, "$P_1{}^{\wedge q} = \text{sign}(q)\ (P_1{}^{\wedge max} / (\sqrt{M} - 1))\ (2|q| - 1)$". The variables $P_1{}^{\wedge q}$ and $P_1{}^{\wedge max}$ are not defined in the claim.

10.2 Claim 5 states in part, "$P_2{}^{\wedge q} = P_1{}^{\wedge q} + (|q| - 1).\ e_1{}^{\wedge}$, where

$e_1\hat{} = (1/s)\,\Sigma_q\,(1/\,(2|q|\,-1)\,\Sigma_{n\in sq}\,(P_1\hat{}^q - y_n{}^q\,)$

$P_1\hat{}^q = \text{sign}(q)\ \ (P_1\hat{}^{max}\,/\,(\sqrt{M}-1))\,(2|q|\,-1)$". The variables $P_1\hat{}^q$, $e_1\hat{}$ and $P_1\hat{}^{max}$ are not defined in the claim.

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 2, 3, 5, 6, 8, 11-14 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12.1 Claim 2 states in part, "estimating constellation points $P\hat{}^q$ within a square constellation with uniformly separated points". It is not clear as to what is being estimated, whether the position (I and Q coordinates) of the constellation points or the signal strength. Therefore, "estimating constellation points $P\hat{}^q$ within a square constellation with uniformly separated points" is undefined, making the claim vague and indefinite.

12.2 Claim 3 states in part, "estimating constellation points $P_{1J}\hat{}^q$ within a general constellation". It is not clear as to what is being estimated, whether the position (I and Q coordinates) of the constellation points or the signal strength. Therefore, "estimating constellation points $P_{1J}\hat{}^q$ within a general constellation" is undefined, making the claim vague and indefinite.

12.3 Claim 5 states in part, "the revising comprises estimating a second set of constellation points P_2^q". It is not clear as to what is being estimated, whether the position (I and Q coordinates) of the constellation points or the signal strength. Therefore, "the revising comprises estimating a second set of constellation points P_2^q" is undefined, making the claim vague and indefinite.

12.4 Claim 6 states in part, "calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample". It is not clear as to what value related to the constellation points is used to compute the reliability factor, whether the position (I and Q coordinates) of the constellation points or the signal strength. Therefore, "calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample" is undefined, making the claim vague and indefinite.

12.5 Claim 7 states in part, "P_{n-i} is the value of a constellation point nearest to the sample y_{n-i}". The specification does not describe anywhere what is meant by "the value of a constellation point" and how it is calculated or measured. Therefore, the value of a constellation point is vague and indefinite.

12.6 Claim 8 states in part, "P_{1n-i} and P_{2n-i} respectively represent first and second dimensional values of a constellation point nearest to y_{n-i}". This implies that the values of the constellation

point are the I and Q coordinates of the point. If so, the reliability cannot be calculated from the coordinate values of the constellation point. Therefore, the reliability of a two-dimensional candidate sample y_n is vague and indefinite.

12.7 Claim 11 states in part, "prioritizing the samples based on values of constellation points". The specification does not describe anywhere what is meant by "the values of constellation points" and how they are calculated or measured. Therefore, the values of constellation points are vague and indefinite.

12.8 Claim 12 states in part, "comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol". The specification does not describe anywhere what is meant by "a value of a constellation point" and how it is calculated or measured. Therefore, the value of a constellation point is vague and indefinite.

12.9 Claim 13 states in part, "adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}". The specification does not describe anywhere what is meant by "a value derived from a constellation point" and how it is calculated or measured. Therefore, a value derived from a constellation point is vague and indefinite.

12.10 Claim 14 states in part, "the adding adds a scaled value of the constellation point to the reliability factor". The specification does not describe anywhere what is meant by "value of the

constellation point" and how it is calculated or measured. Therefore, a value of the constellation point is vague and indefinite.

12.13 Claim 17 states in part, "determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold,

if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol". The constellation points are defined by the I and Q coordinates of the points. The thresholds are defined for signal strength or power. Therefore, determining whether ...constellation points ... is within a predetermined threshold, and... designating the candidate sample as a reliable symbol are undefined, making the claim vague and indefinite.

13. Claim 1 is rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential structural cooperative elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are:

13.1 Claim 1 states, "A channel gain estimation method" and lists steps of identifying the reliable symbols and estimating the constellation size. However, it does not include a step of calculating the channel gain from the constellation size and signal strengths of the symbols at the constellation points. Therefore the claim is incomplete as it omits essential elements.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

15. Claim 6 is rejected under 35 U.S.C. § 102(e) as being anticipated by **Hassan** (U.S. Patent 6,581,179).

15.1 **Hassan** teaches methods for generating side information in the presence of time-selective fading. Specifically, as per claim 6, **Hassan** teaches a reliable symbol identification method (Abstract, L1-8; CL2, L44-59); comprising:

calculating a reliability factor of a candidate sample from constellation points nearest to each of a plurality of samples in proximity to the candidate sample (Abstract, L1-8; CL2, L44-59);

if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL2, L27-36; CL3, L45-54).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

17. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Alouini et al.** (U.S. Patent 6,304,593) in view of **Hassan** (U.S. Patent 6,581,179).

18.1 As per claim 1, **Alouini et al.** teaches a channel gain estimation method (CL4, L1-2; CL2, L10-12); comprising:

estimating a constellation size from a set of maximally-sized reliable symbols (CL4, L46-54).

Alouini et al. does not expressly teach identifying reliable symbols from a sequence of captured data samples. **Hassan** teaches identifying reliable symbols from a sequence of captured data samples (Abstract, L1-8; CL2, L44-59), because significant enhancement in system performance, especially with respect to signal-to-noise ratio is possible using reliable symbols (CL2, L59-62). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Alouini et al.** with the method of **Hassan** that included identifying reliable symbols from a sequence of captured data samples. The artisan would have been motivated because the multi-path signals when added together would increase the signal strength, thus raising the quality of received signal; processing the gain of combined multi-path signals would suppress interference between multiple paths; and the accumulation method would compensate for the intersymbol interference.

18.2 As per claim 4, **Alouini et al.** and **Hassan** teach the method of claim 1. **Alouini et al.** teaches revising the estimate of the constellation size based on additional reliable symbols (CL4, L46-54).

19. Claims 7, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 6,581,179) in view of **Dent** (U.S. Patent 6,556,634).

19.1 As per claim 7, **Hassan** teaches the method of claim 6. **Hassan** does not expressly teach that the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|\, c_i, \text{ where}$$

P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample, and

c_i is a coefficient. **Dent** teaches that the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|\, c_i, \text{ where}$$

P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample, and

c_i is a coefficient (CL1, L31-44; CL3, L4-9; CL4, L56-63; CL17, L54 to CL18, L50), because the multi-path signals when added together increase the signal strength, thus raising the quality of received signal (CL1, L31-34); processing the gain of combined multi-path signals suppresses interference between multiple paths (CL1, L43-44); and the accumulation method compensates for the intersymbol interference (CL4, L10-11). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Dent** that included the reliability factor R_n of the candidate sample is given by:

$$R_n = \Sigma_{i=-K1,\, i\neq 0}^{K2} (|P_{n-i}|\, c_i, \text{ where}$$

P_{n-i} is the value of a constellation point nearest to the sample y_{n-i} which is in proximity to the candidate sample y_n,

Kl, K2 are numbers of samples adjacent to the candidate sample, and

c_i is a coefficient. The artisan would have been motivated because the multi-path signals when added together would increase the signal strength, thus raising the quality of received signal; processing the gain of combined multi-path signals would suppress interference between multiple paths; and the accumulation method would compensate for the intersymbol interference.

19.2 As per claims 13 and 14, **Hassan** teaches method of identifying reliable symbols(Abstract; L1-8; CL2, L44-59); comprising:

for a candidate sample y_n:

iteratively, for i= - K_1 to K_2, i#0:

if the reliability factor exceeds a predetermined limit, disqualifying the candidate sample as a reliable symbol (CL2, L27-36; CL3, L45-54); and

otherwise, incrementing i and, if i=0, re-incrementing i for a subsequent iteration;

thereafter, unless the candidate symbol has been disqualified, designating the candidate sample as a reliable symbol (CL2, L27-36; CL3, L45-54).

Hassan does not expressly teach adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}; and the adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i. **Dent** teaches adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}; and the adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i (CL1, L31-44; CL3, L4-9; CL4, L56-63; CL17, L54 to CL18, L50), because the multi-path signals when added together

increase the signal strength, thus raising the quality of received signal (CL1, L31-34); processing the gain of combined multi-path signals suppresses interference between multiple paths (CL1, L43-44); the accumulation method compensates for the intersymbol interference (CL4, L10-11); and the weighting may assign lower weight to older symbols and a higher weight to more recent symbols (CL4, L59-61). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Dent** that included adding to a reliability factor a value derived from a constellation point nearest to a sample y_{n-i}; and the adding adds a scaled value of the constellation point to the reliability factor, the value scaled in accordance with a predetermined coefficient c_i. The artisan would have been motivated because the multi-path signals when added together would increase the signal strength, thus raising the quality of received signal; processing the gain of combined multi-path signals would suppress interference between multiple paths; the accumulation method would compensate for the intersymbol interference; and the weighting might assign lower weight to older symbols and a higher weight to more recent symbols.

20. Claim 9-12 rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 6,581,179) in view of **Isaksson et al.** (U.S. Patent 6,438,174).

20.1 As per claim 9, **Hassan** teaches the method of claim 6. **Hassan** does not expressly teach for any samples having similar reliability factors, prioritizing the samples based on the samples' values. **Isaksson et al.** teaches for any samples having similar reliability factors, prioritizing the samples based on the samples' values (CL2, L49-63; CL2, L36-39; CL2, L44-48), because the

performance can be optimized by carefully setting the signal level at the receiver ADC; and this would handle problems associated with inter-symbol interference caused by time dispersion (CL11, L29-33). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for any samples having similar reliability factors, prioritizing the samples based on the samples' values. The artisan would have been motivated because performance could be optimized by carefully setting the signal level at the receiver ADC; and this would handle problems associated with inter-symbol interference caused by time dispersion.

20.2 As per claim 10, **Hassan** teaches the method of claim 6. **Hassan** teaches if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL2, L27-36; CL3, L45-54). **Hassan** does not expressly teach for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. **Isaksson et al.** teaches for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol (CL2, L39-42; CL2, L64-67), because as per **Hassan** significant enhancement in system performance, especially with respect to signal-to-noise ratio is possible using reliable symbols (CL2, L59-62). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for any sample having a reliability factor that is less than the predetermined limit, comparing the sample's value against a

second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. The artisan would have been motivated because significant enhancement in system performance, especially with respect to signal-to-noise ratio is possible using reliable symbols.

20.3 As per claim 11, **Hassan** teaches the method of claim 6. **Hassan** does not expressly teach for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples. **Isaksson et al.** teaches for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples (CL2, L49-63; CL2, L36-39; CL2, L44-48), because the performance can be optimized by carefully setting the signal level at the receiver ADC; and this would handle problems associated with inter-symbol interference caused by time dispersion (CL11, L29-33). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for any samples having similar reliability factors, prioritizing the samples based on values of constellation points nearest to the samples. The artisan would have been motivated because performance could be optimized by carefully setting the signal level at the receiver ADC; and this would handle problems associated with inter-symbol interference caused by time dispersion.

20.4 As per claim 12, **Hassan** teaches the method of claim 6. **Hassan** teaches if the reliability factor is less than a predetermined limit, designating the candidate sample as a reliable symbol (CL2, L27-36; CL3, L45-54). **Hassan** does not expressly teach for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation

point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. **Isaksson et al.** teaches for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol (CL2, L39-42; CL2, L64-67), because as per **Hassan** significant enhancement in system performance, especially with respect to signal-to-noise ratio is possible using reliable symbols (CL2, L59-62). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for any sample having a reliability factor that is less than the predetermined limit, comparing a value of a constellation point nearest to the sample to a second threshold and, if the value exceeds the threshold, disqualifying the sample as a reliable symbol. The artisan would have been motivated because significant enhancement in system performance, especially with respect to signal-to-noise ratio is possible using reliable symbols.

20.5 As per claim 17, **Hassan** teaches method of identifying reliable symbols (Abstract, L1-8; CL2, L44-59). **Hassan** does not expressly teach for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol. **Isaksson et al.** teaches for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none

of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol (CL2, L36-39; CL2, L44-66), because the deviation of the received signal from a corresponding constellation point can be used to calculate a parameter; the parameter can be compared to an upper and lower limit and if the parameter is outside the limits the constellation used to modulate the carrier can be changed (CL2, L36-42). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included for a candidate sample, determining whether any of a plurality of constellation points each associated with sample neighboring the candidate sample is within a predetermined threshold; and if none of the constellation points exceed the threshold, designating the candidate sample as a reliable symbol (Cl2, L36-39; CL2, L44-66). The artisan would have been motivated because the deviation of the received signal from a corresponding constellation point could be used to calculate a parameter; the parameter could be compared to an upper and lower limit and if the parameter was outside the limits the constellation used to modulate the carrier could be changed.

21. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 6,581,179) in view of **Dent** (U.S. Patent 6,556,634), and further in view of **Isaksson et al.** (U.S. Patent 6,438,174).

21.1 As per claims 15 and 16, **Hassan** and **Dent** teach the method of claim 13. **Hassan** does not expressly teach that the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation; and the

predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol. **Isaksson et al.** teaches that the predetermined limit is (K1+K2) d_{min} where d_{min} is half a distance between two constellation points that are closest together in a governing constellation; and the predetermined limit is the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol (CL2, L31-39; CL2, L44-48; CL2, L49-51; CL20, L53-57), because performance can be optimized by carefully setting the signal level at the receiver ADC; and this handles problems associated with inter-symbol interference caused by time dispersion (CL11, L29-33). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Isaksson et al.** that included the predetermined limit being (K1+K2) d_{min} where d_{min} was half a distance between two constellation points that were closest together in a governing constellation; and the predetermined limit being the product of Kl +K2 and half the width of an annular constellation ring associated with the candidate symbol. The artisan would have been motivated because performance could be optimized by carefully setting the signal level at the receiver ADC; and this would handle problems associated with inter-symbol interference caused by time dispersion.

22. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hassan** (U.S. Patent 6,581,179) in view of **Isaksson et al.** (U.S. Patent 6,438,174), and further in view of **Temerinac** (U.S. Patent 6,477,215).

22.1 As per claims 18 and 19, **Hassan** and **Isaksson et al.** teach the method of claim 17. **Hassan** does not expressly teach that the neighboring samples occur in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occur in a pair of windows that are adjacent to, and on either side of the candidate sample. **Temerinac** teaches that the neighboring samples occur in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occur in a pair of windows that are adjacent to, and on either side of the candidate sample (CL4, L21-24), because information on the respective symbols can be evaluated without interference from neighboring symbols at the symbol sampling instants; and the farther the current symbol sampling instant is away from the neighboring optimum sampling instants, the greater the intersymbol interference (CL7, L12-17). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Hassan** with the method of **Temerinac** that included the neighboring samples occurring in a first window adjacent to the candidate sample on one side of the candidate sample; and the neighboring symbols occurring in a pair of windows that would be adjacent to, and on either side of the candidate sample. The artisan would have been motivated because information on the respective symbols could be evaluated without interference from neighboring symbols at the symbol sampling instants; and the farther the current symbol sampling instant was away from the neighboring optimum sampling instants, the greater the intersymbol interference.

Conclusion

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on 571-272-3716. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

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K. Thangavelu
Art Unit 2123
February 3, 2005

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER